

Exam 2

MAT 129, Spring 2018

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Name: _____

Problem 1:

```
In[155]:= f[x_] := Cos[x] / (x^2 - 3)
Together[f'[x]]
g[x_] := Cos[x^2 - 3]
g'[x]
p[x_] := (Cos[x])^2 - 3
p'[x]
q[x_] := Cos[x] (x^2 - 3)
Together[q'[x]]

- 2 x Cos[x] + 3 Sin[x] - x^2 Sin[x]
Out[156]= -----
              (- 3 + x^2)^2
```

```
Out[158]= 2 x Sin[3 - x^2]
```

```
Out[160]= - 2 Cos[x] Sin[x]
```

```
Out[162]= 2 x Cos[x] + 3 Sin[x] - x^2 Sin[x]
```

Problem 3:

```
In[163]:= thickness = 1
V[r_] := Pi r^2 thickness
D[V[r[t]], t]
1000 / (2 π 25)
rprime = 1000 000 / (2 π 2500)
N[%]
(2 π 25) rprime
aprime = (2 π 2500) rprime
N[%]
```

```
Out[163]= 1
```

```
Out[165]= 2 π r[t] r'[t]
```

```
Out[166]= 20
          π
```

```
Out[167]= 200
          π
```

```
Out[168]= 63.662
```

```
Out[169]= 10 000
```

```
Out[170]= 1 000 000
```

```
Out[171]= 1. × 106
```

Problem 4:

```

In[172]:= Clear[x, y]
soln = Solve[D[x^2 + y[x]^2 == 1, x], y'[x]]
yp[x_] = y'[x] /. First[First[soln]]
soln = Solve[x^2 + y^2 == 1, y]
y[x_] = -First[y /. First[Second[soln]]]
yp[x]
yp[1/2]
N[%]

```

$$\text{Out[173]} = \left\{ \left\{ y'[x] \rightarrow -\frac{x}{y[x]} \right\} \right\}$$

$$\text{Out[174]} = -\frac{x}{y[x]}$$

$$\text{Out[175]} = \left\{ \left\{ y \rightarrow -\sqrt{1-x^2} \right\}, \left\{ y \rightarrow \sqrt{1-x^2} \right\} \right\}$$

$$\text{Out[176]} = \sqrt{1-x^2}$$

$$\text{Out[177]} = -\frac{x}{\sqrt{1-x^2}}$$

$$\text{Out[178]} = -\frac{1}{\sqrt{3}}$$

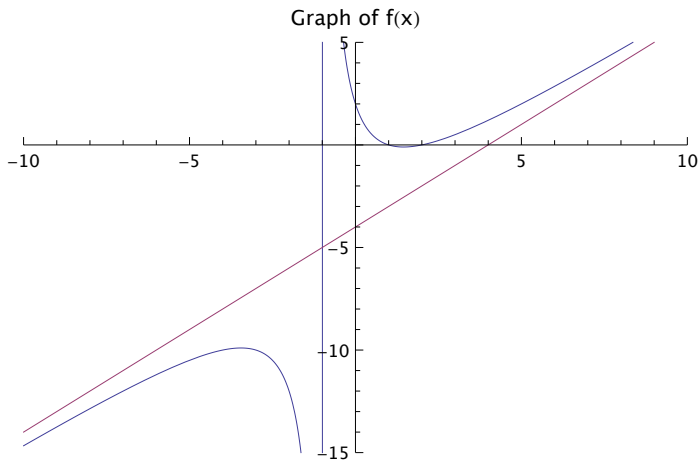
$$\text{Out[179]} = -0.57735$$

Problem 5:

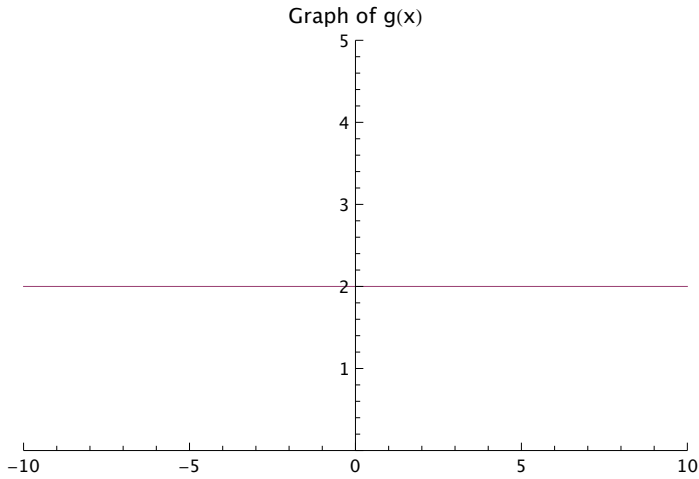
```

In[180]:= Plot[{(x^2 - 3 x + 2) / (x + 1), x - 4}, {x, -10, 10},
  PlotRange -> {{-10, 10}, {-15, 5}}, PlotLabel -> "Graph of f(x)"]
Plot[{(2 x^2 - 3 x + 2) / CubeRoot[x^6 + 1], 2}, {x, -10, 10},
  PlotRange -> {{-10, 10}, {0, 5}}, PlotLabel -> "Graph of g(x)"]
Plot[{Sqrt[x^2 + 2 x - 2], x + 1, -(x + 1)}, {x, -10, 10},
  PlotRange -> {{-10, 10}, {0, 10}}, PlotLabel -> "Graph of h(x)"]

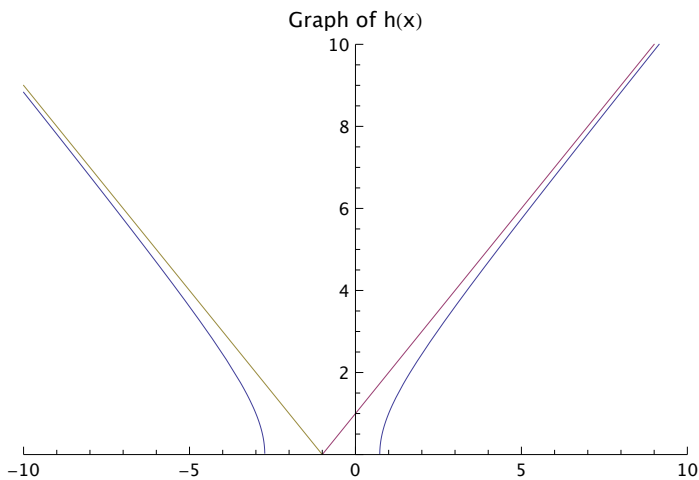
```



Out[180]=



Out[181]=



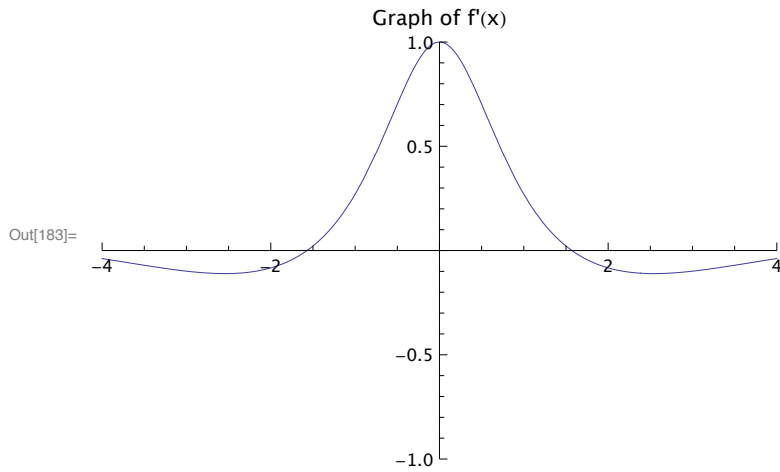
Out[182]=

Problem 6:

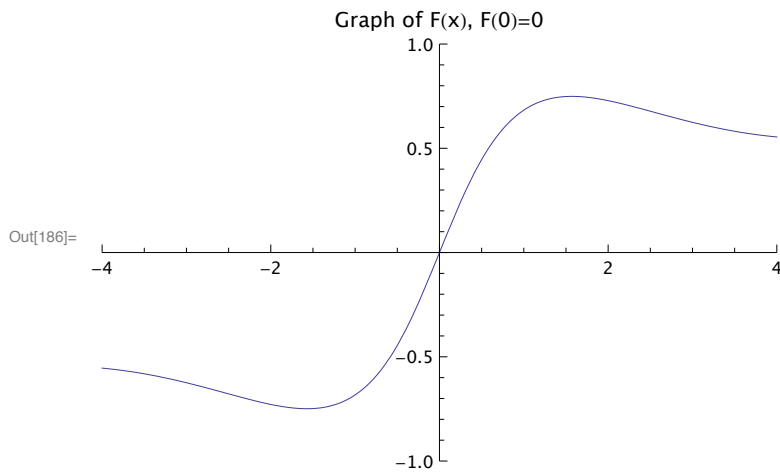
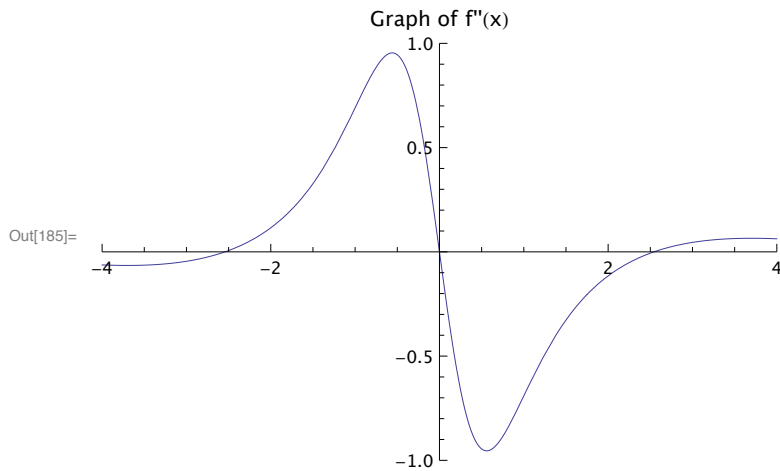
```

In[183]:= Plot[Cos[x] / (x^2 + 1), {x, -4, 4},
  PlotRange -> {{-4, 4}, {-1, 1}}, PlotLabel -> "Graph of f'(x)"]
g[x_] = D[Cos[x] / (x^2 + 1), x]
Plot[g[x], {x, -4, 4}, PlotRange -> {{-4, 4}, {-1, 1}}, PlotLabel -> "Graph of f''(x)"]
Plot[NIntegrate[Cos[x] / (x^2 + 1), {x, 0, t}], {t, -4, 4},
  PlotRange -> {{-4, 4}, {-1, 1}}, PlotLabel -> "Graph of F(x), F(0)=0"]

```



Out[184]=
$$-\frac{2x \cos[x]}{(1+x^2)^2} - \frac{\sin[x]}{1+x^2}$$

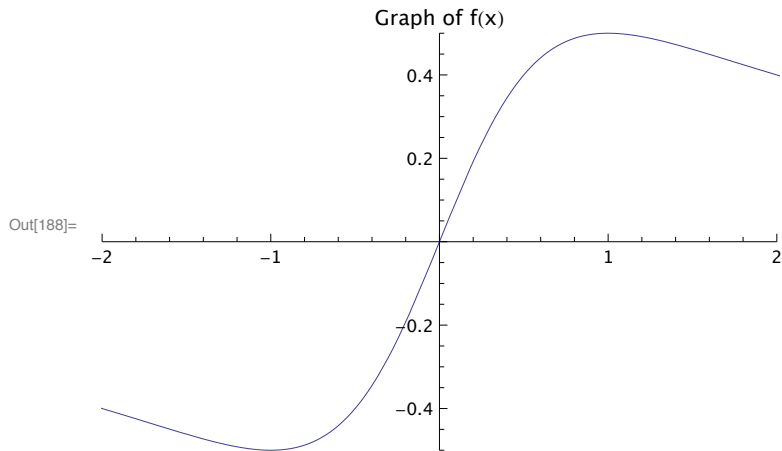


Problem 7:

```

In[187]:= f[x_] := x / (x^2 + 1)
Plot[f[x], {x, -3, 3}, PlotRange -> {{-2, 2}, {-0.5, 0.5}}, PlotLabel -> "Graph of f(x)"]
Together[f'[x]]
Together[f''[x]]
(* Plot[Sqrt[-1]x/(x^2+1), {x, -3, 3},
PlotRange -> {{-2, 2}, {-0.5, 0.5}}, PlotLabel -> "Graph of f(x)"] *)

```



Out[189]=

$$\frac{1 - x^2}{(1 + x^2)^2}$$

Out[190]=

$$\frac{2(-3x + x^3)}{(1 + x^2)^3}$$